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10/578,140	05/03/2006	Chang Hae Kim	3449-0620PUS1	8843

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EXAMINER	
BOWMAN, MARY ELLEN	

ART UNIT	PAPER NUMBER
4174	

NOTIFICATION DATE	DELIVERY MODE
06/17/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/578,140	KIM ET AL.	
	Examiner	Art Unit	
	MARY ELLEN BOWMAN	4174	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3 May 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 3 May 2006 was considered by the examiner.

Claim Objections

3. Claims 2 and 3 are objected to because of the following informalities: The particle size is written as "mm" and may have been intended to be "μm". Appropriate correction is required. Examiner will consider the aforementioned claims to include "μm" and not "mm".

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 25, 26, and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Srivastava et al., USPN 6,621,211 B1, published 16 September 2003 (hereinafter referred to as "Srivastava").

6. Regarding claim 25, Srivastava teaches a method for producing a phosphor (e.g., col 13, lines 43-44; "the method of making the second preferred...phosphor"), comprising the steps of: providing the stoichiometric quantities of an oxygen compound of at least one element selected

from the group consisting of strontium (Sr), magnesium (Mg) and barium (Ba) and an oxygen compound of europium (e.g., col 13, lines 50-54; "the preferred starting phosphor compounds comprise barium carbonate $BaCO_3$, strontium carbonate $SrCO_3$...europium oxide Eu_2O_3, and silicic acid SiO_2"); mixing the oxygen compounds (e.g., col 13, lines 45-46; "the starting compounds of the phosphor are manually blended or mixed"); and thermally treating the mixture (e.g., col 13, lines 56-60; "the starting powder mixture is then fired...to form a first calcined phosphor body or cake") to convert the same into a silicate phosphor including europium activated with rare earth ions (e.g., col 13, lines 43-44; "the second preferred $(Ba,Sr,Ca)_2SiO_4:Eu^{2+}$ phosphor"; Note: The $:Eu^{2+}$ indicates that the phosphor is activated by a europium ion, and europium is a rare earth metal).

7. Regarding claim 26, Srivastava teaches the invention as explained above regarding claim 25, and further teaches the step of adding at least one fluxing compound selected from the group consisting of boride, chloride and fluoride after the oxygen compounds are mixed (e.g., col 13, lines 54-55; "preferably, a flux, such as CaF_2 is added to the starting materials").

8. Regarding claim 29, Srivastava teaches the invention as explained above regarding claim 25, and further teaches the thermal treatment step is carried out at 800 to 1500 degrees Celsius (e.g., col 13, lines 56-60; "the starting powder mixture is then fired…at 1200 to 1400 degrees C...to form a first calcined phosphor body or cake").

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

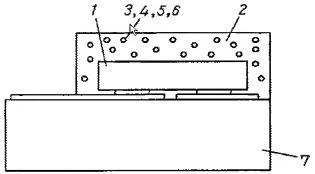
having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al., WO 2003/032407 A1, published 17 April 2003 (hereinafter referred to as "Maeda"). Note: The attached English translation of the above referenced document has been used for purposes of this Office Action.

11. Regarding claim 1, Maeda teaches a phosphor having the chemical formula: $Sr_{4-x}Mg_yBa_zSi_2O_8:Eu^{2+}_x$ ($0<x<1$, $0\leq y\leq 1$, $0\leq z\leq 1$) (e.g., p. 6 [of the attached English translation]; "$Sr_3MgSi_2O_8:Eu^{2+}$…as the green fluorescent substance [phosphor]"; Note: In this example, "x" would be 1, "y" would be 1, and "z" would be 0).

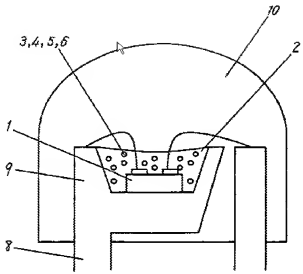
12. Regarding claim 8, Maeda teaches a light emitting device including a phosphor (e.g., p. 19; "semiconductor luminescent equipment"), comprising: a light source (e.g., p. 14; "the flip chip type LED 1"); a support for supporting the light source (e.g., p. 14; "submount element 7"); a light transmitting member provided at least one portion around the light source (e.g., p. 14; "the package of the resin [light transmitting member]…containing the…fluorescent substance particles"; see Figure 1 below); and a phosphor having the chemical formula: $Sr_{4-x}Mg_yBa_zSi_2O_8:Eu^{2+}_x$ ($0<x<1$, $0\leq y\leq 1$, $0\leq z\leq 1$) incorporated in the light transmitting member (e.g., p. 6 [of the attached English translation]; "$Sr_3MgSi_2O_8:Eu^{2+}$…as the green fluorescent substance [phosphor]"; Note: In this example, "x" would be 1, "y" would be 1, and "z" would be 0).

FIG. 1



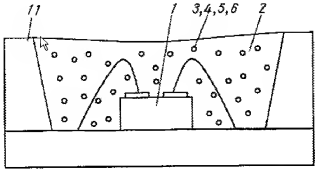
13. Regarding claim 23, Maeda teaches a lamp type (see Figure 2 below, a lamp type light emitting device) light emitting device including a phosphor (e.g., p. 19; "semiconductor luminescent equipment"), comprising: a light source (e.g., p. 14; "the flip chip type LED 1"); a support for supporting the light source (e.g., p. 14; "the cup 9"); a molding member provided at least one portion around the light source (e.g., p. 14; "the package of the resin [molding member]…containing the…fluorescent substance particles 3…4…5…6"; see Figure 2 below); and a phosphor having the chemical formula: $Sr_{4-x}Mg_yBa_zSi_2O_8:Eu^{2+}_x$ ($0<x<1$, $0\leq y\leq 1$, $0\leq z\leq 1$) incorporated in the light transmitting member (e.g., p. 6 [of the attached English translation]; "$Sr_3MgSi_2O_8:Eu^{2+}$…as the green fluorescent substance [phosphor]"; Note: In this example, "x" would be 1, "y" would be 1, and "z" would be 0).

FIG. 2



14. Regarding claim 24, Maeda teaches a surface mounting type (see Figure 3 below, a surface mounting type light emitting device) light emitting device including a phosphor (e.g., p. 19; "semiconductor luminescent equipment"), comprising: a light source (e.g., p. 14; "the flip chip type LED 1"); a support for supporting the light source (e.g., p. 14; "case 11"); a molding member provided at least one portion around the light source (e.g., p. 14; "the package of the resin [molding member]…containing the…fluorescent substance particles 3…4…5…6"; see Figure 2 below, element 2); and a phosphor having the chemical formula: $Sr_{4-x}Mg_yBa_zSi_2O_8:Eu^{2+}_x$ ($0<x<1$, $0\leq y\leq 1$, $0\leq z\leq 1$) incorporated in the light transmitting member (e.g., p. 6 [of the attached English translation]; "$Sr_3MgSi_2O_8:Eu^{2+}$…as the green fluorescent substance [phosphor]"; Note: In this example, "x" would be 1, "y" would be 1, and "z" would be 0).

FIG. 3



15. Regarding claims 1, 8, 23 and 24, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use $0<x<1$ in measuring and preparing the claimed phosphor, based on the teaching of the prior art that $x = 1$, because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Further the critical relationship between the Eu concentration and the Sr concentration is anticipated by the prior art. Thus, reconstruction is desirable as taught by the prior art reference.

16. Regarding claim 2, Maeda teaches the invention as explained above regarding claim 1, and further teaches the average particle size is less than 20 μm (e.g., p. 18; "the main particle diameter of 1 micrometer or more and 20 micrometers or less is desirable").

17. Regarding claim 4, Maeda teaches the invention as explained above regarding claim 1, and further teaches the phosphor is excited by the light generated from a compound semiconductor to have a main peak ranging from 500 to 600 nm (e.g., p. 5; "the semiconductor light emitting element which combines the green fluorescent substance which has a luminescence peak to a wavelength field (520 nm or more and 570 nm or less)").

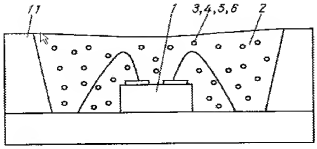
18. Regarding claim 6, Maeda teaches the invention as explained above regarding claim 1, and further teaches a main emission peak of the phosphor shifts according to the concentration of Eu^{2+} (e.g., p. 18; "the amount x of Eu addition of luminescence intensity is weak in composition of a numerical value smaller than said within the limits").

19. Regarding claim 10, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light transmitting member is a molding member (e.g., p. 14; "the phosphor layer 2 which formed [molded] BGRY fluorescent substance particles (3, 4, 5, 6) by resin [molding member]").

20. Regarding claim 12, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light transmitting member is molded entirely around the light emitting device (see Figure 1 above, light transmitting member 2 entirely surrounds light emitting device 1).

21. Regarding claim 13, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light transmitting member is molded partially around the light emitting device (see Figure 3 below, light transmitting member 2 only surrounds three sides of light emitting device 1).

FIG. 3



22. Regarding claim 14, Maeda teaches the invention as explained above regarding claim 8, and further teaches white light is emitted by the light emitted from the light source and the light excited by the phosphor (e.g., pp. 14-15; "the phosphor layer 2 absorbs the near-ultraviolet light which LED 1…emits…changing into…the white system light").

23. Regarding claim 22, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light source is a gallium nitride light emitting diode (e.g., p. 4; "LED [light emitting diode]…constituted from a gallium nitride system compound semiconductor").

24. Regarding claim 3, Maeda teaches the invention as explained above regarding claim 1, and further teaches the average particle size of the phosphor is 5 to 15 μm (e.g., p. 18; "the main particle diameter…2 micrometers or more and 10 micrometers or less are more desirable").

25. Regarding claim 5, Maeda teaches the invention as explained above regarding claim 1, and further teaches the phosphor is excited by the light having a main peak ranging from 400 to 480 nm (e.g., p. 6; "the outside LED…releases a blue system (400nm or more and 530nm or less)") to have a main emission peak ranging from 500 to 600 nm (e.g., p. 5; "the semiconductor light emitting element which combines the green fluorescent substance which has a luminescence peak to a wavelength field (520 nm or more and 570 nm or less)").

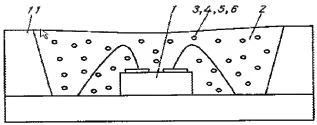
26. Regarding claims 7, 9 and 15, Maeda teaches the inventions as explained above regarding claims 1 and 8, and further teaches the mole concentration of Eu^{2+} is 0.02 to 0.20 mol (e.g., p. 7; "the amount of Eu2+…within the limits of $0.01 \leq x \leq 0.05$").

27. Regarding claim 11, Maeda teaches the invention as explained above regarding claim 8, and further teaches the mixing ratio of the phosphor with respect to the light transmitting

member is 5 to 50 wt% (e.g., p. 22; "the weight ratio of…an epoxy resin, and these fluorescent substances (mixed fluorescent substance) was set to 20:80 for the mixed weight rate").

28. Regarding claim 16, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light emitting device is a top view type (see Figure 3 below), the concentration of Eu^{2+} is 0.02 to 0.10 mol (e.g., p. 7; "the amount of Eu2+…within the limits of $0.01 \leq x \leq 0.05$").

FIG. 3



29. Regarding claim 17, Maeda teaches the invention as explained above regarding claim 16, and further teaches the content of the phosphor with respect to the light transmitting member is 10 to 30 wt% (e.g., p. 22; "the weight ratio of…an epoxy resin, and these fluorescent substances (mixed fluorescent substance) was set to 20:80 for the mixed weight rate").

30. Regarding claim 18, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light emitting device is a side view type (e.g., p. 8; "the source of LED side luminescence"), the concentration of Eu^{2+} is 0.08 to 0.15 mol (e.g., p. 7; "the amount of Eu2+…within the limits of $0.01 \leq x \leq 0.05$").

31. Regarding claim 19, Maeda teaches the invention as explained above regarding claim 18, and further teaches the content of the phosphor with respect to the light transmitting member is 5

to 20 wt% (e.g., p. 22; "the weight ratio of…an epoxy resin, and these fluorescent substances (mixed fluorescent substance) was set to 20:80 for the mixed weight rate").

32. Regarding claim 20, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light emitting device is used as a white light source of a backlight (e.g., pp. 14-14; "the phosphor layer 2 absorbs the near-ultraviolet light which LED 1…emits…changing into…the white system light"), the concentration of Eu^{2+} included in the phosphor is 0.02 to 0.10 mol (e.g., p. 7; "the amount of Eu2+…within the limits of $0.01 \leq x \leq 0.05$"), and the content of the phosphor with respect to the light transmitting member is 15 to 50 wt% (e.g., p. 22; "the weight ratio of…an epoxy resin, and these fluorescent substances (mixed fluorescent substance) was set to 20:80 for the mixed weight rate").

33. Regarding claim 21, Maeda teaches the invention as explained above regarding claim 8, and further teaches the light emitting device is used as a blue light source of a backlight (e.g., p. 15; "the blue system fluorescent"), the concentration of Eu^{2+} included in the phosphor is 0.02 to 0.10 mol (e.g., p. 7; "the amount of Eu2+…within the limits of $0.01 \leq x \leq 0.05$"), and the content of the phosphor with respect to the light transmitting member is 10 to 40 wt% (e.g., p. 22; "the weight ratio of…an epoxy resin, and these fluorescent substances (mixed fluorescent substance) was set to 20:80 for the mixed weight rate").

34. Regarding claims 3, 5, 7, 9, 11, and 15-21, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the particle size of the phosphor to between 5 and 15 μm, to optimize the wavelength of light exciting the phosphor from between 400 and 480 nm, to optimize the mole concentration of Eu^{2+} to between 0.02 to 0.20 mol or 0.08 to 0.15 mol, and to optimize the wt % of phosphor in the light transmitting member to between 5

to 50 wt% or 10 to 30 wt% or 5 to 20 wt% or 15 to 50 wt% or 10 to 40 wt%, based on the teachings of Maeda of similar ranges to those listed above, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Thus, reconstruction is desirable as taught by the prior art reference.

35. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Srivastava.

36. Regarding claim 27, Srivastava teaches the oxygen compounds are mixed using a small amount of solvent selected from the group consisting of distilled water, alcohol and acetone, and then dried at 100 to 400 degrees Celsius (e.g., col 14, lines 5-6; "preferably, the solid body is wet milled in propanol, methanol and/or water, and subsequently dried"; col 13, lines 33-34; "the starting powder mixture is then heated in air at about 300 to 800 degrees C").

37. Regarding claim 28, Srivastava teaches the thermal treatment step is carried out under a mixture gas atmosphere of nitrogen and hydrogen, and the volume ratio of nitrogen and hydrogen is preferably 75 to 98:25 to 2 (e.g., col 13, lines 63-65; "the powder is annealed in a furnace in an atmosphere comprising nitrogen and 0.1 to 10% hydrogen").

38. It would have been obvious to one of ordinary skill in the art at the time the invention was made to dry the solvent mixture at a temperature from 100 to 400 degrees Celsius and to heat treat the mixture in nitrogen and hydrogen in the ratio of 75 to 98:25 to 2, based on the teaching of Srivastava that the drying can take place at between 300 and 800 degrees Celsius and the nitrogen hydrogen ratio is between 0.1 and 10% hydrogen, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or

workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Thus, reconstruction is desirable as taught by the prior art reference.

Conclusion

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARY ELLEN BOWMAN whose telephone number is (571)270-5383. The examiner can normally be reached on Monday-Thursday, 6:30 a.m.-5:00 p.m. EST.

40. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kimberly D. Nguyen can be reached on (571) 272-2402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

41. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./
Examiner, Art Unit 4174

/Kimberly D Nguyen/
Supervisory Patent Examiner, Art Unit 4174